

What is claimed is:

1. A method of processing nonferrous metal alloy, comprising:
  - heating the nonferrous metal alloy with a liquid metal sodium at a first temperature to put the nonferrous metal alloy in a solid solution state; and
  - cooling the nonferrous metal alloy with a liquid metal sodium at a second temperature to suppress growth of a Guinier-Preston (G-P) zone in the nonferrous metal alloy while in the solid solution state.
2. The method according to claim 1, wherein the nonferrous metal alloy includes aluminum.
3. The method according to claim 1, wherein the first temperature is set to generate a grating defect caused by transition in a crystal structure of the nonferrous metal alloy.
4. The method according to claim 1, wherein the first temperature is set such that an alloy element in the nonferrous metal alloy enters the solid solution state.
5. The method according to claim 3 or 4, wherein the first temperature is set to be more than or equal to 450 °C.
6. The method according to claim 1, wherein the second temperature is set such that the crystal structure of the nonferrous metal alloy is miniaturized while maintaining a grating defect caused by transition in a crystal structure therein, and that the solid solution state is supersaturated.
7. The method according to claim 1, further comprising cooling the nonferrous metal alloy by water.
8. The method according to claim 7, wherein the cooling by water includes removing liquid metal sodium left on the nonferrous

metal alloy.

9. The method according to claim 7, wherein the cooling by water acts such that the solid solution state of the nonferrous metal alloy stops growth of the G-P zone and a supersaturated solid solution state is entered.

10. The method according to claim 1, further comprising heating the nonferrous metal alloy by an aging process after the cooling by water.

11. The method according to claim 1, wherein the heating by the aging process includes keeping the nonferrous metal alloy at a temperature approximately between 100 °C and 200 °C in a certain period.

12. The method according to claim 1, further comprising rolling the nonferrous metal alloy after heating by the aging process.

13. An apparatus for processing nonferrous metal alloy, comprising:

a first liquid metal sodium tub that stores liquid metal sodium at a first temperature and heats the nonferrous metal alloy to put the nonferrous metal alloy in a solid solution state;

a second liquid metal sodium tub that stores liquid metal sodium at a second temperature and cools the nonferrous metal alloy to suppress growth of a Guinier-Preston (G-P) zone in the nonferrous metal alloy while in the solid solution state; and

a carrier that carries the nonferrous metal alloy from the first liquid metal sodium tub to the second liquid metal sodium tub.

14. The apparatus according to claim 13, wherein the nonferrous metal alloy includes aluminum.

15. The apparatus according to claim 13, wherein the first

temperature is set to generate a grating defect caused by transition in a crystal structure in the nonferrous metal alloy.

16. The apparatus according to claim 13, wherein the first temperature is set such that alloy element in the nonferrous metal alloy enters a solid solution state.

17. The apparatus according to claim 15 or 16, wherein the first temperature is set to be more than or equal to 450 °C.

18. The apparatus according to claim 13, wherein the second temperature is set such that the crystal structure of the nonferrous metal alloy is miniaturized while maintaining a grating defect caused by transition in a crystal structure therein, and that the solid solution state is supersaturated.

19. The apparatus according to claim 13, further comprising a water tub that cools the nonferrous metal alloy processed by the second liquid metal sodium tub.

20. The apparatus according to claim 19, wherein the water tub is used to remove liquid metal sodium left on the nonferrous metal alloy.

21. The apparatus according to claim 19, wherein the water tub is used such that the solid solution state of the nonferrous metal alloy stops growth of the G-P zone and a supersaturated solid solution is entered.

22. The apparatus according to claim 13, further comprising a heating tub that heats the nonferrous metal alloy by an aging process.

23. The apparatus according to claim 22, wherein the heating tub is used to keep the nonferrous metal alloy at a temperature approximately between 100 °C and 200 °C in a certain period.

24. The apparatus according to claim 22, further comprising a pressing machine that rolls the nonferrous metal alloy processed by the heating tub.

25. The apparatus according to claim 13, further comprising a liquid metal sodium circulating system that controls the temperature of the liquid metal sodium in each of the first liquid metal sodium tub and the second liquid metal sodium tub.

26. The apparatus according to claim 13, further comprising an inert gas supply source that covers the first liquid metal sodium tub and the second liquid metal sodium tub with inert gas.

27. The apparatus according to claim 19, further comprising:  
a water cooling chamber having a further water tub,  
a hydrogen remover that removes hydrogen in the water cooling chamber, and  
a pressure fluctuation absorber that absorb the fluctuation of pressure in the water cooling chamber.

28. The apparatus according to claim 13, wherein the carrier includes a roller partially soaked in liquid metal sodium, the roller having a supporting mechanism that supports the rotating axis thereof such that the rotating axis is disposed above the liquid metal sodium.

29. A method of processing nonferrous metal alloy, comprising a step of:

heating the nonferrous metal alloy such that nonferrous metal is put in a solid solution state, and

cooling the nonferrous metal alloy to suppress growth of a Guinier-Preston (G-P) zone in the nonferrous metal alloy while in the solid solution state.

30. The method according to claim 29, where the nonferrous

metal alloy is heat by a liquid metal sodium.

31. The method according to claim 29, where the nonferrous metal alloy is cooled by a liquid metal sodium.

32. An apparatus of processing nonferrous metal alloy, comprising:

a heating furnace that heats the nonferrous metal alloy such that nonferrous metal alloy is put in a solid solution state,

a liquid metal sodium tub that stores liquid metal sodium and cools the nonferrous metal alloy to suppress growth of a Guinier-Preston (G-P) zone in the nonferrous metal alloy while in the solid solution state, and

a carrier that carries the nonferrous metal alloy from the heating furnace to the liquid metal sodium tub.

33. A nonferrous metal alloy formed according to the method of claim 1.

34. A nonferrous metal alloy formed according to the method of claim 29.